## REMARKS

Claims 1-31 were pending in the above-referenced application, all stood rejected under §103(a). Applicant cancels Claims 1-4 with out prejudice and traverses such rejection with respect to Claims 4-31. In addition, new Claim 32 is added. Examination of the instant application in view of the amendments and remarks herein is respectfully requested.

In addition, Applicant submits herewith a Supplemental Information Disclosure Statement with PTO Form-1449 and copies of cited art for the Examiner's review and acceptance. The Examiner has not indicated whether or not the drawings submitted August 30, 1999, have been approved. Applicant requests acknowledgement of this approval in the Examiner's next action.

**Rejections under 35 U.S.C. §103(a):**

*Watanabe et al.*

Claims 1-31 stand rejected under 35 U.S.C.§103(a) as being unpatentable over Watanabe et al. (U.S. Patent No. 6,153,898, hereinafter "Watanabe"). Claims 1-4 are canceled making the rejection of such claims moot. The remarks below are thus directed to the traversal of the rejection of Claims 5-31.

Claim 5 recites, in pertinent part:

> A capacitor ... having a high k capacitor dielectric region ... comprising a layer of metal oxide having multiple different metals bonded with oxygen, one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current

leakage potential which is greater than the first current leakage potential

The Background section of the instant application describes that while some metal oxides have high dielectric constants (high K) such materials also have high leakage currents, thus making their use in structures such as capacitors problematic since their high leakage currents allows any charge stored in the dielectric layer to dissipate. Applicant's invention, for example the embodiment recited in Claim 5, is directed to providing a high K dielectric region with a leakage current sufficiently low to prevent the rapid dissipation of the stored charge. These characteristics, dielectric constant and leakage current, are important for capacitors that are used in some integrated circuit devices, for example DRAM devices as they are factors in determining both the amount of charge such a capacitor can store and the time that such charge can held by the capacitor before it dissipates.

In the Final Office Action (Paper No. 12), the Examiner reiterated the original rejection of Claims 1-31 from Paper No. 7. This rejection is based upon U.S. Patent No. 6,153,898 to Watanabe, which is directed to a Ferroelectric Capacitor. Ferroelectric capacitors, and the manner in which such capacitors can be used in memory devices, have been know for some time. To establish this general level of knowledge, Applicant provides herewith, the article *The Physics of Ferroelectric Memories,* Physics Today p. 22-27, July, 1998. Referring to the section entitled "How NVFRAMs work" beginning on page 22 of the above-referenced article, it is seen that ferroelectric capacitors, such as taught by

Watanabe, store a Boolean algebraic "1" and "0" as **a polarization state of the ferroelectric layer**. Further reading of this section describes that the polarization state is determined by measuring the voltage passed through the ferroelectric layer when a positive switching voltage is applied. Thus where the polarization of the layer is positive, the measures voltage will be higher than if the polarization of the layer is negative. This functioning of a ferroelectric capacitor in a memory cell is also described in Watanabe at column 6, lines 10-27.

Thus it can be seen that Watanabe's ferroelectric capacitor operates in a completely different manner than the capacitors recited in the claims of the instant application, in that they do not store charge. The dielectric constant and current leakage potential of Watanabe's layers are NOT factors of concern to a skilled artisan forming a capacitor in accordance with Watanabe's teachings. Therefore it is not surprising that Watanabe never mentions either characteristic in the cited patent. Rather, Watanabe discussed polarizability and crystal size in the context varying composition of the layers since such characteristics are important to the artisan being instructed in the forming of a ferroelectric capacitor. As a result, Applicant respectfully asserts that Watanabe DOES NOT teach or even suggest, "one of the metals when bonded with oxygen having a first current leakage potential, another of the metals when bonded with oxygen having a second current leakage potential which is greater than the first current leakage potential" as recited in Claim 5.

The Examiner is also reminded that when applying 35 U.S.C. §103, the claimed invention must be considered as a whole, and any applied reference must likewise be considered as a whole. MPEP §2141. Further, in determining the differences between the prior art and the claims, the question under 35 U.S.C. §103 is not whether differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. MPEP §2141.02. In addition, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. MPEP §2141.02. Also, there must be some suggestion or motivation to modify a reference to arrive at the Applicant's claim, and as Watanabe is directed to ferroelectric capacitors that are read by sensing a polarity, none is seen in Watanabe. MPEP §2143.01.

where the structure cited above is the value of the dielectric constant and leakage current are the important criteria in selecting a material for an electrical capacitor, polarizability and crystal size are the important criteria for a material used in a ferroelectric capacitor as such capacitors DO NOT STORE CHARGE.

To this effect, Watanabe discusses the how the polarizability of the materials employed for layers 15a, 15b and 15c varies with changing composition. Watanabe teaches, at col. 4, lines 22-24, that "[t]here is a relationship between the formula and the residual polarization value of the oxide" (where the formula refers composition of the material is question). Watanabe further states that this variation (in polarizability)

results in the layers (15a, 15b and 15c) having a different proportion of the first material (in at least one layer) which consequently varies in one direction through the depth of the layers and provides for both maintaining excellent ferroelectricity and the reduction of crystal grain size (see, col. 4, lines 28-39). Watanabe DOES NOT teach or even suggest that any variation in the potential of the layers results from this changing composition, as alleged by the Examiner.

In summary, Applicant having responded to each of the rejections and objections, respectfully asserts that Claims 5-32 are in condition for allowance. Action to that effect is earnestly sought. If, however the Examiner's next action is anything other than a Notice of Allowance, the Examiner is requested to call the undersigned to schedule a telephonic interview. The undersigned is available during normal business hours, Pacific Coast Time.

Respectfully submitted,

Dated: Sept 5, 2001

By: Bernard Berman

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# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. .................................................. 09/388,063
Priority Filing Date .................................................. August 30, 1999
Inventor .................................................. Vishnu K. Agarwal
Assignee .................................................. Micron Technology, Inc.
Priority Group Art Unit .................................................. 2815
Priority Examiner .................................................. J. Fenty
Attorney's Docket No. .................................................. MI22-1196
Title: Capacitors Having a Capacitor Dielectric Layer Comprising a Metal Oxide Having Multiple Different Metals Bonded With Oxygen



## VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING PRELIMINARY AMENDMENT

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

Cancel Claims 1-4.

Add Claim 32.

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